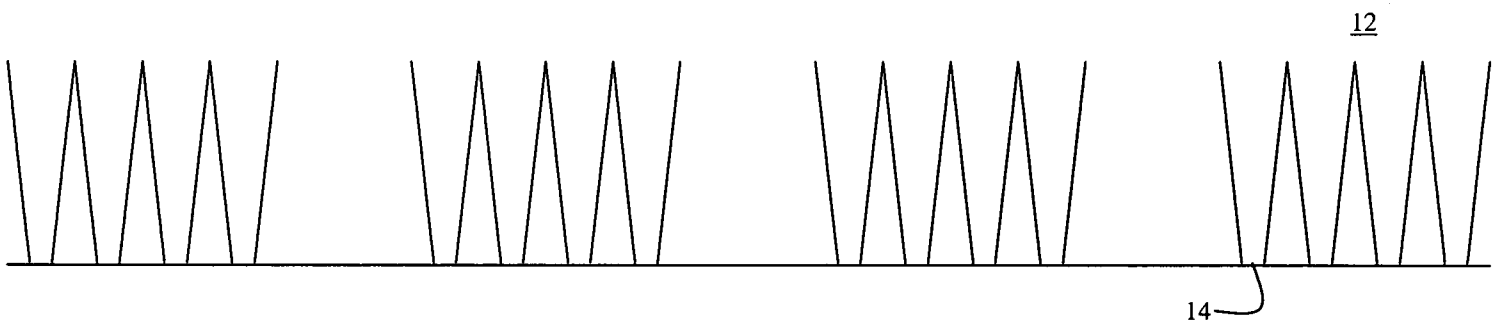
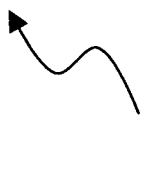


FIGURE 1



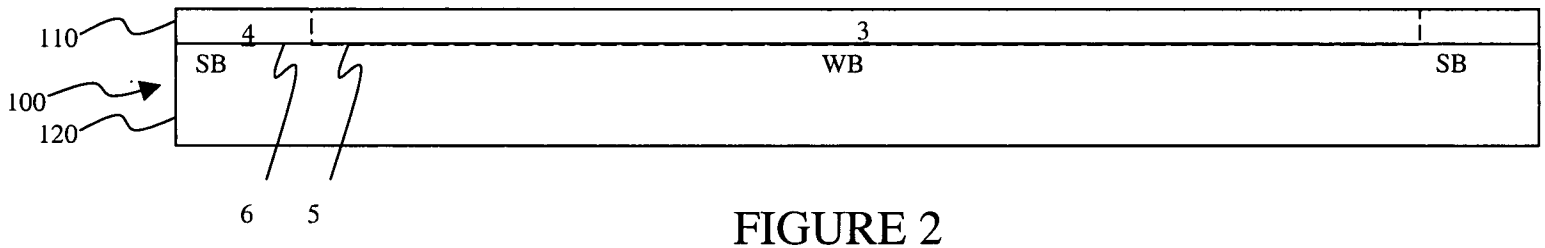


FIGURE 2

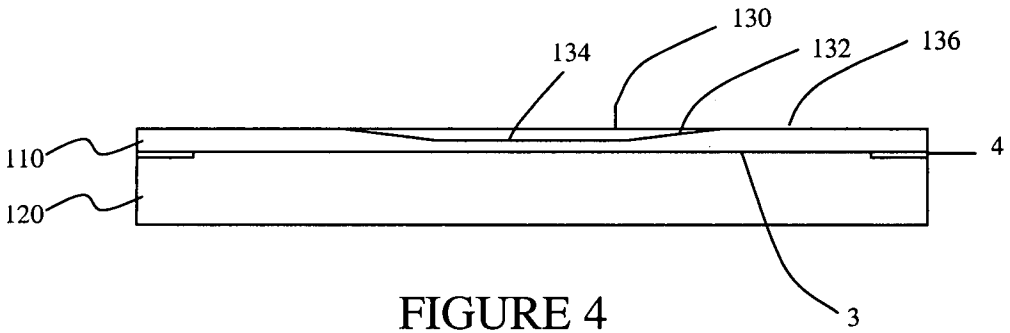


FIGURE 4

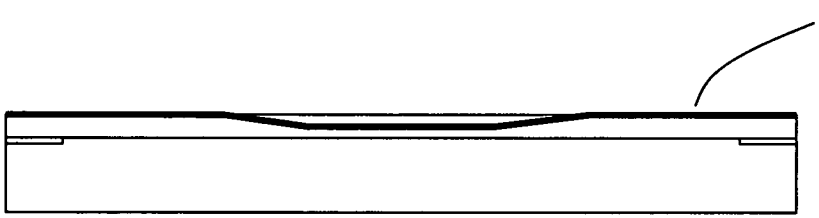


FIGURE 5A

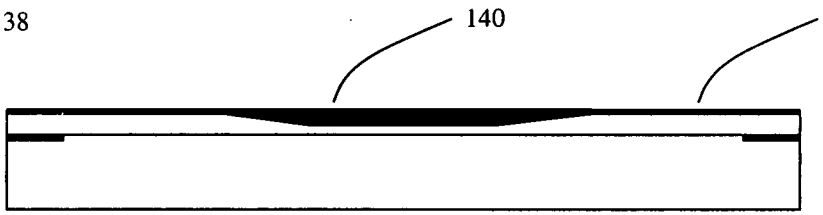


FIGURE 5B

FIGURE 3B

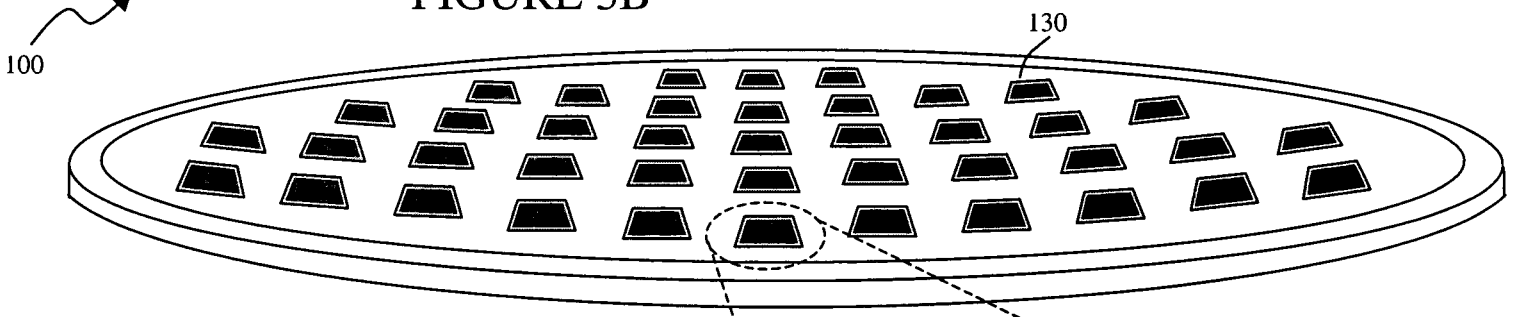
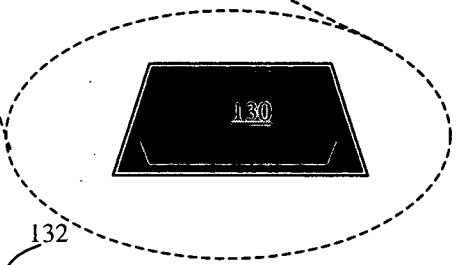


FIGURE 3A



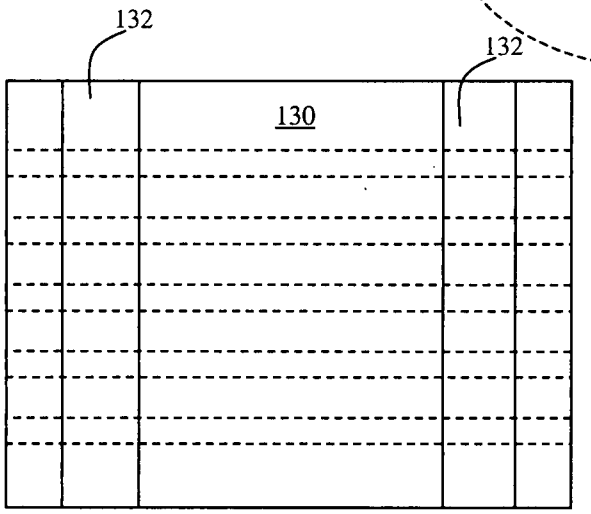


FIGURE 3C

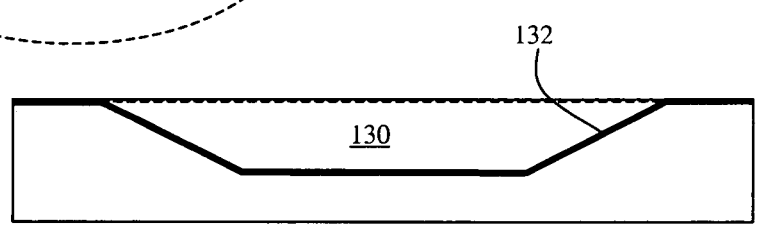


FIGURE 3D

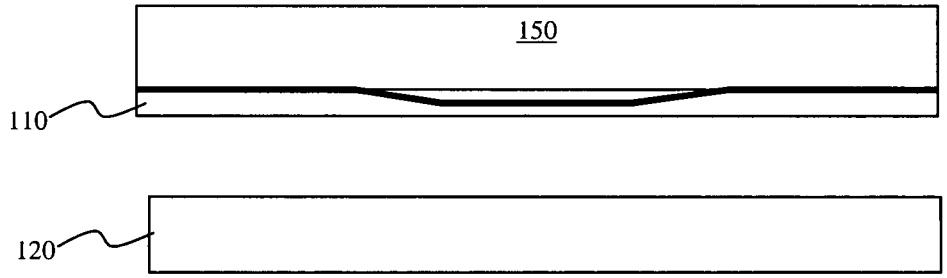


FIGURE 6

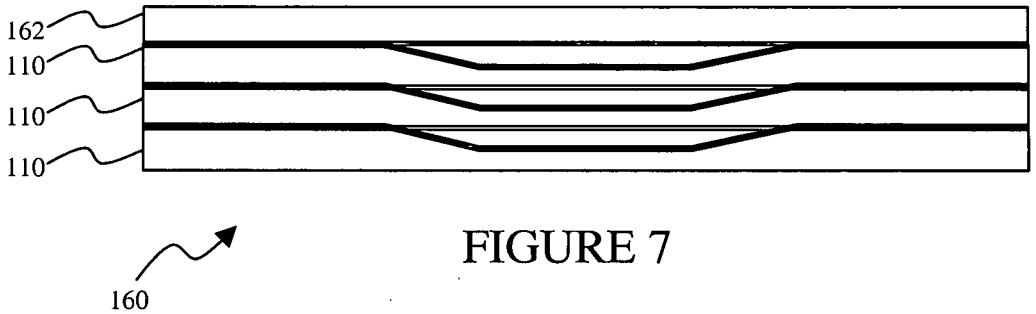


FIGURE 7

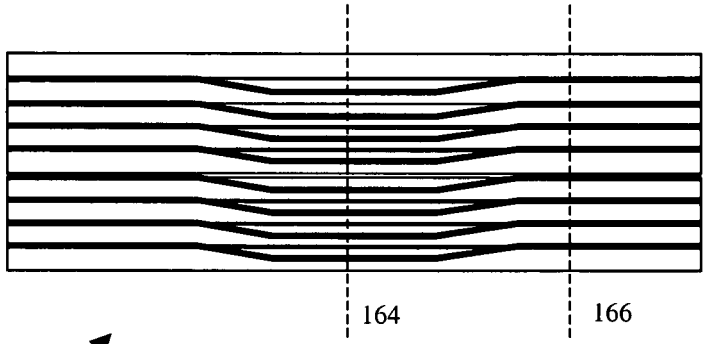


FIGURE 8

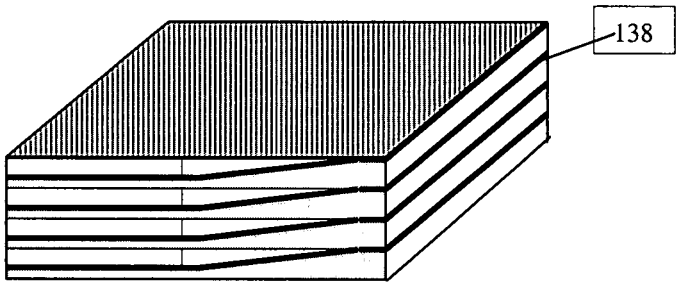


FIGURE 9

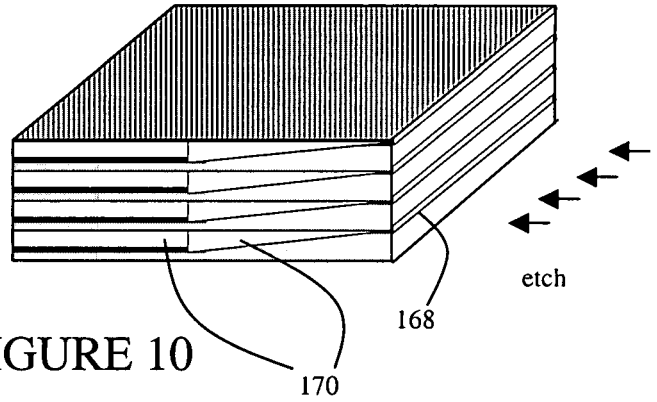


FIGURE 10

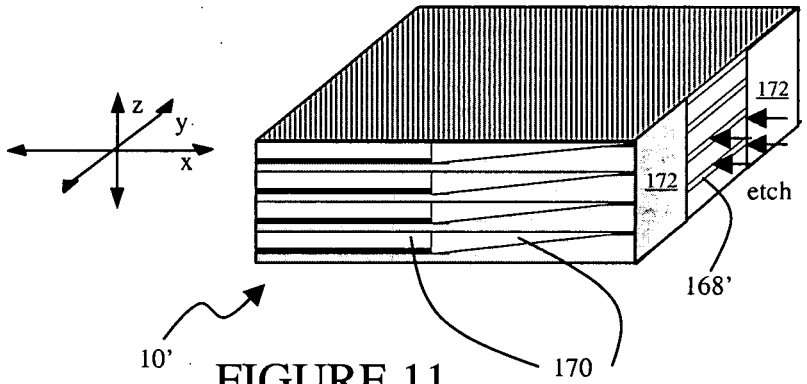


FIGURE 11

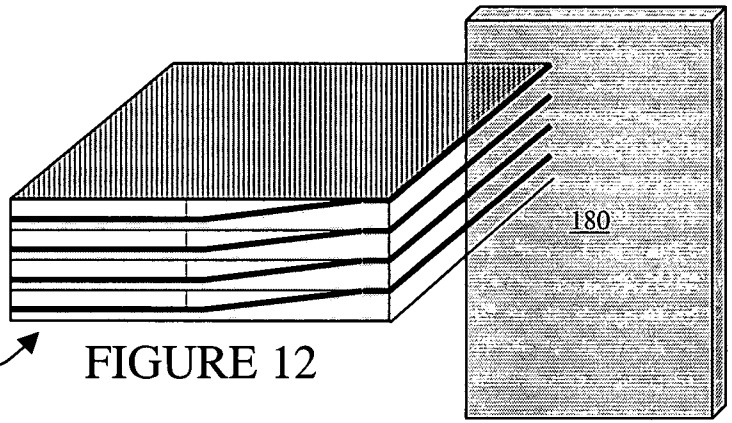


FIGURE 12

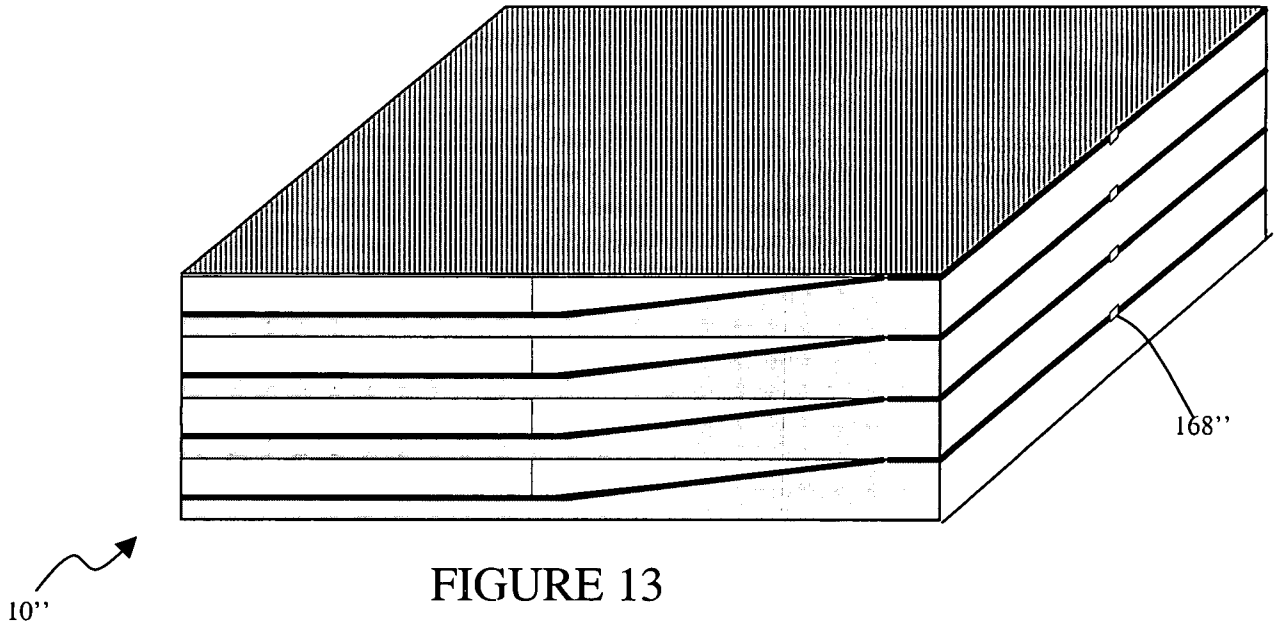


FIGURE 13

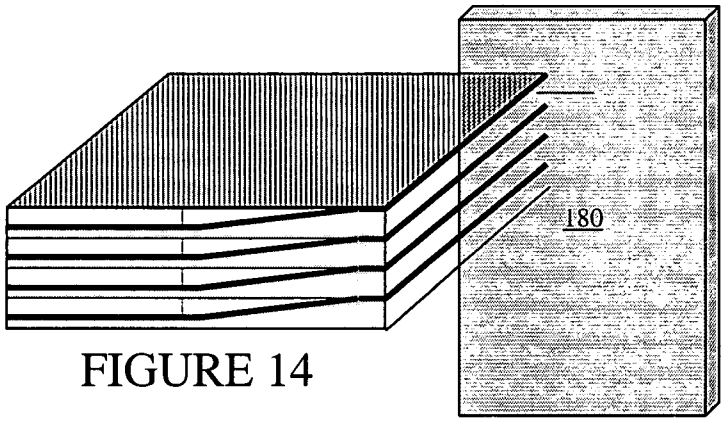


FIGURE 14

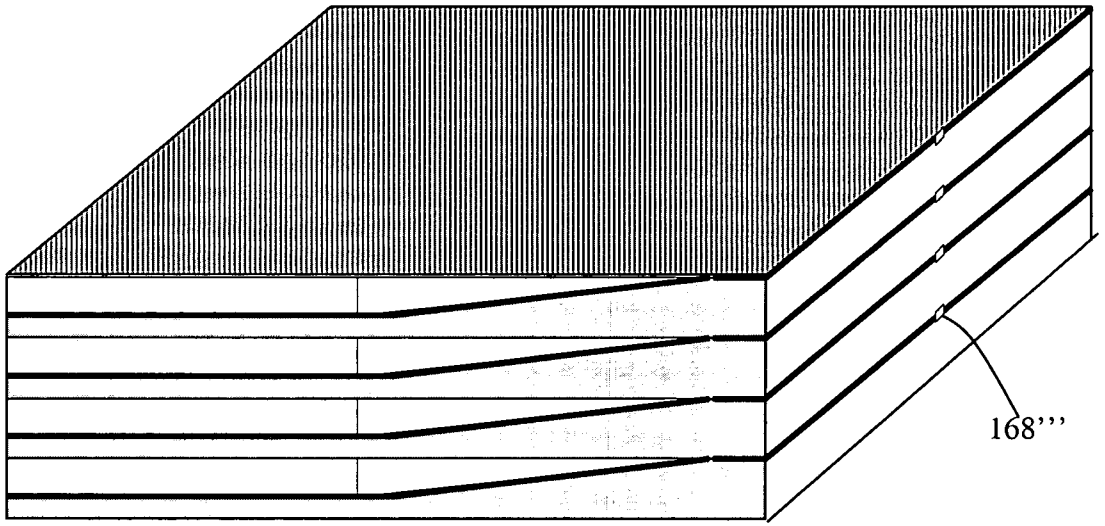


FIGURE 15

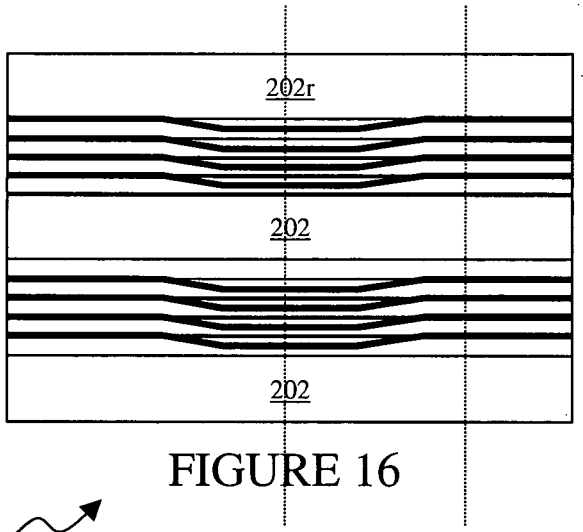


FIGURE 16

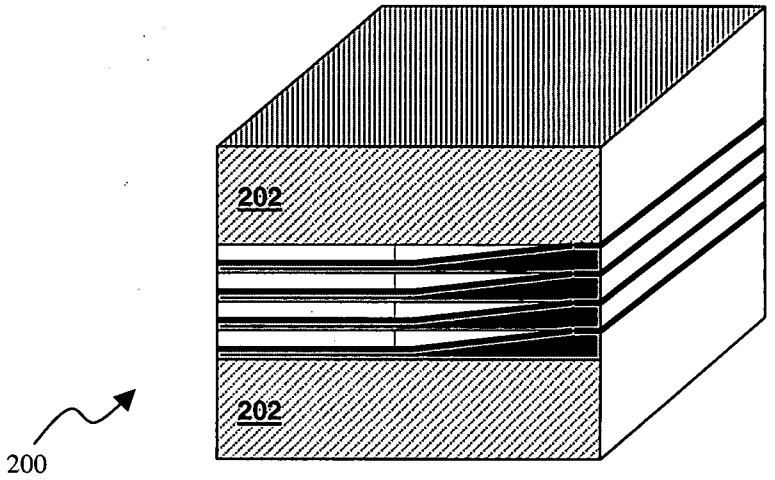


FIGURE 17

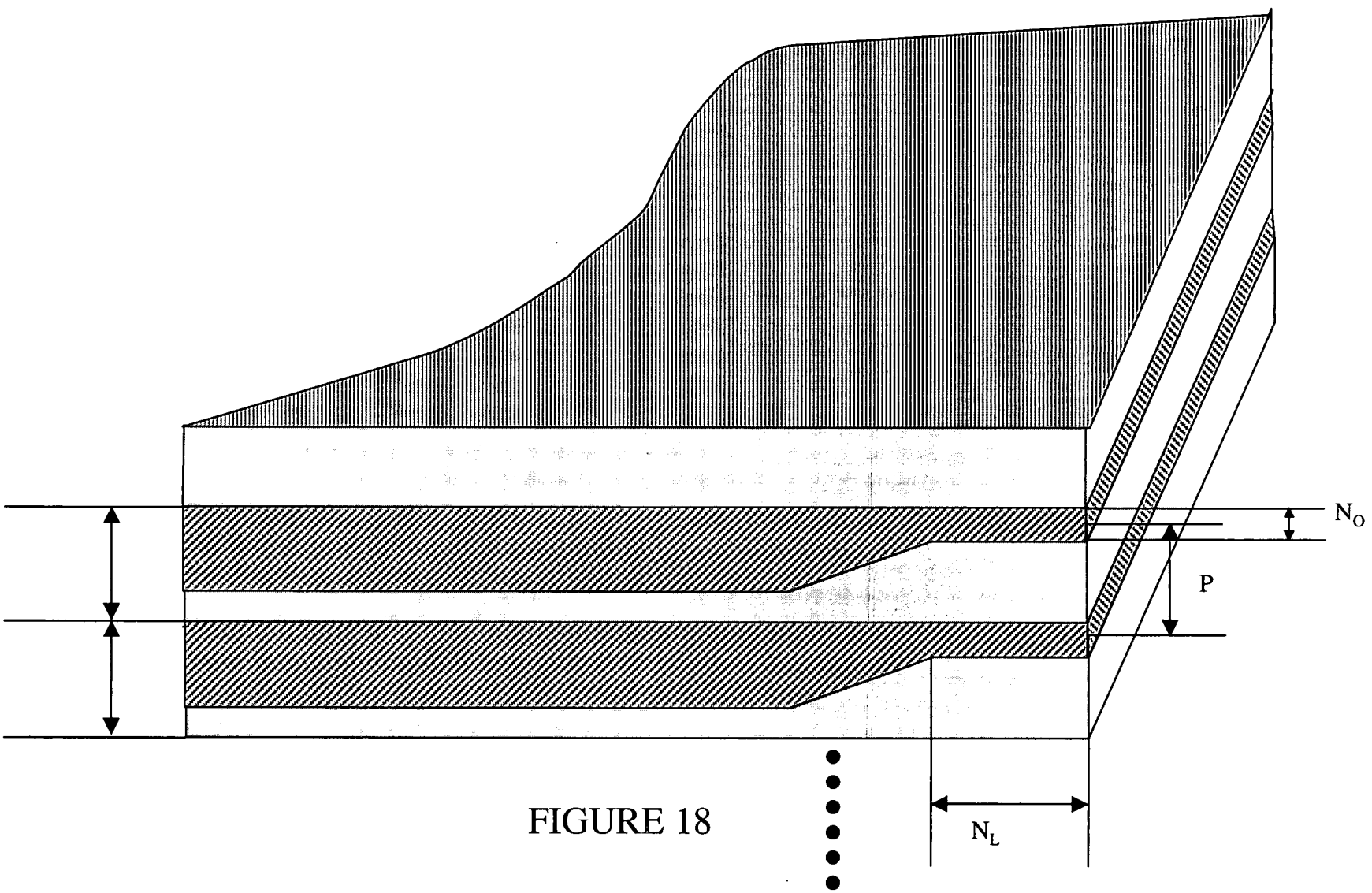


FIGURE 18

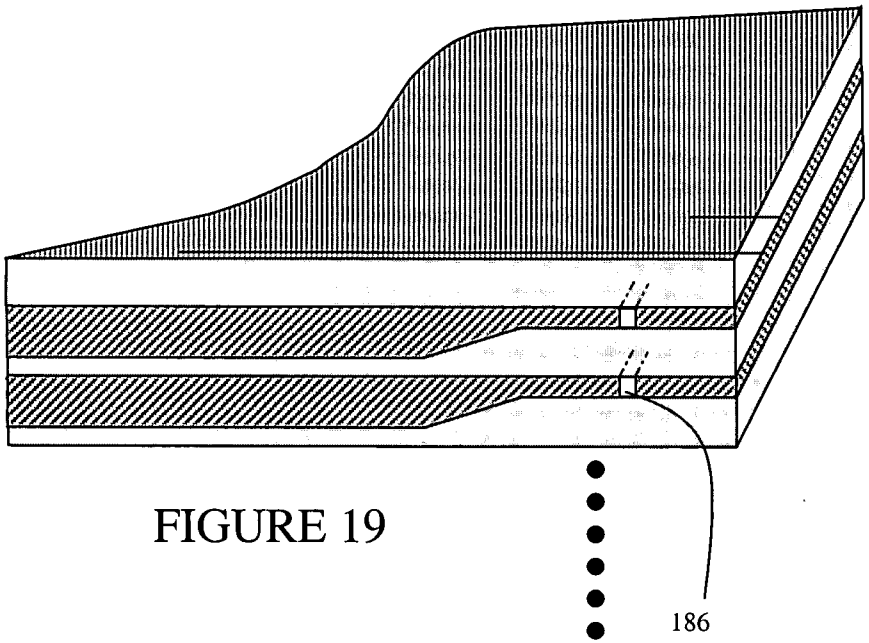


FIGURE 19

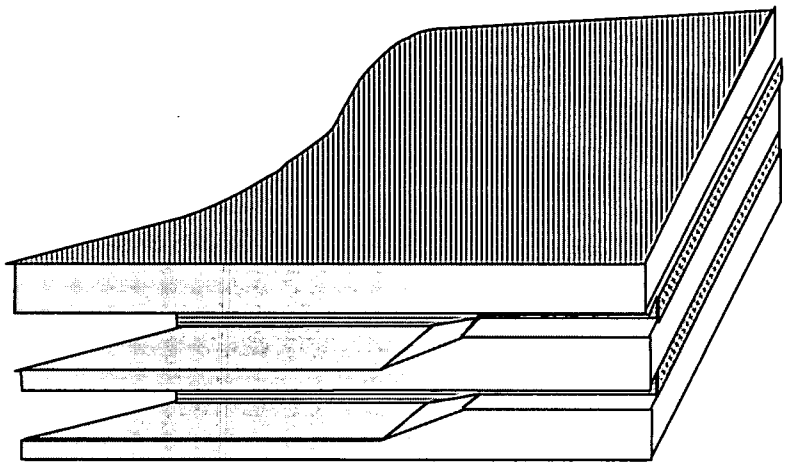


FIGURE 20A

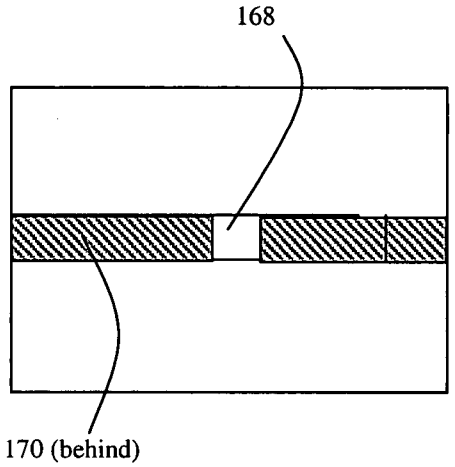


FIGURE 20B

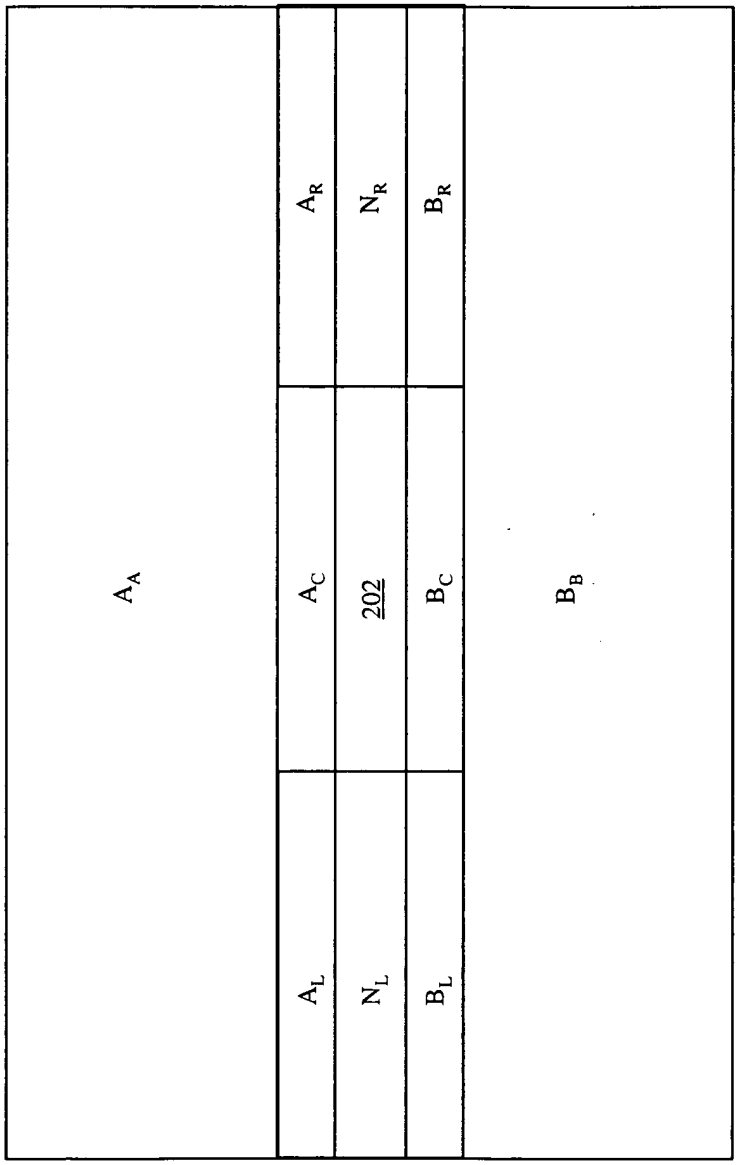


FIGURE 21

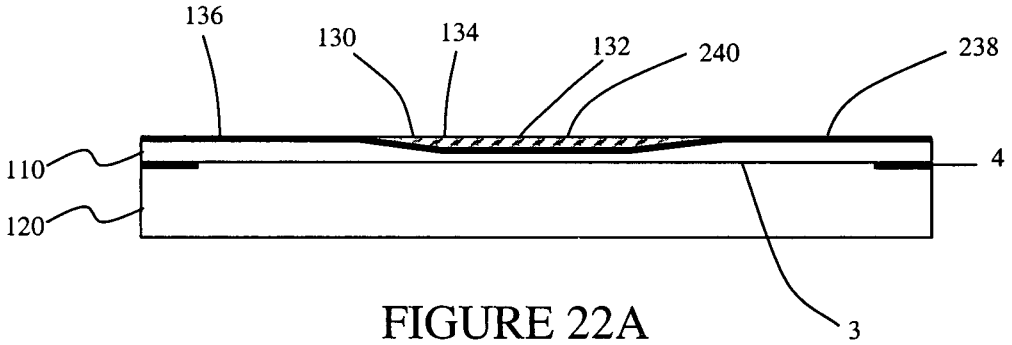


FIGURE 22A

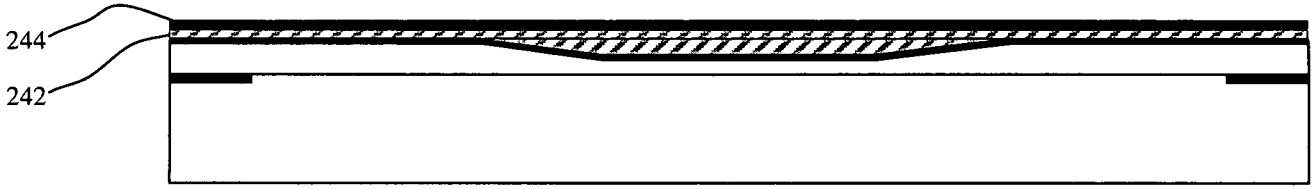


FIGURE 22B

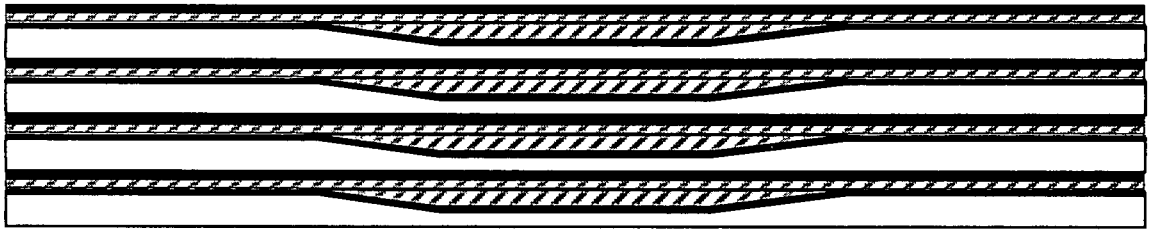


FIGURE 22C

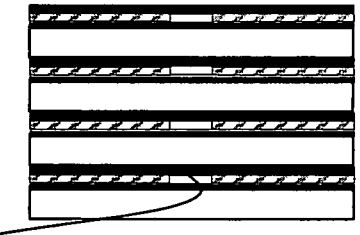


FIGURE 22D

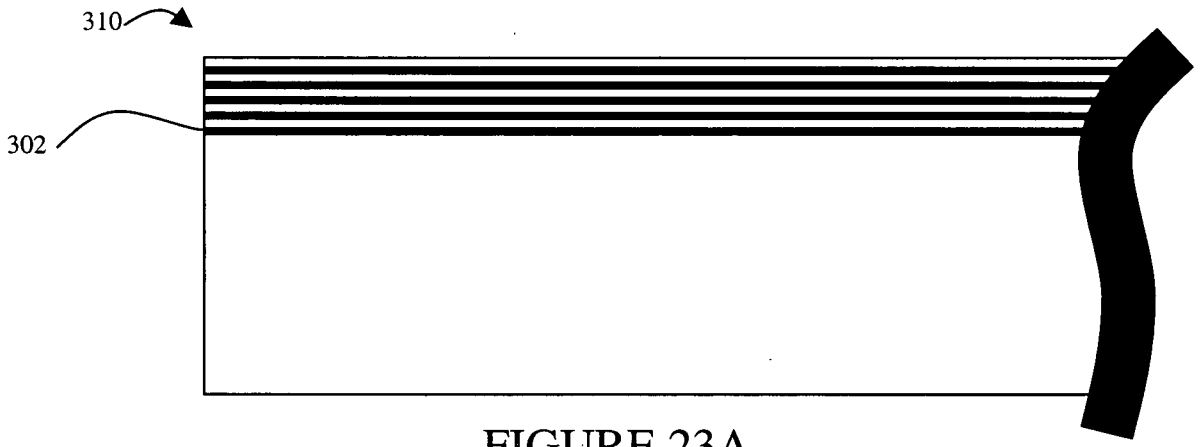


FIGURE 23A

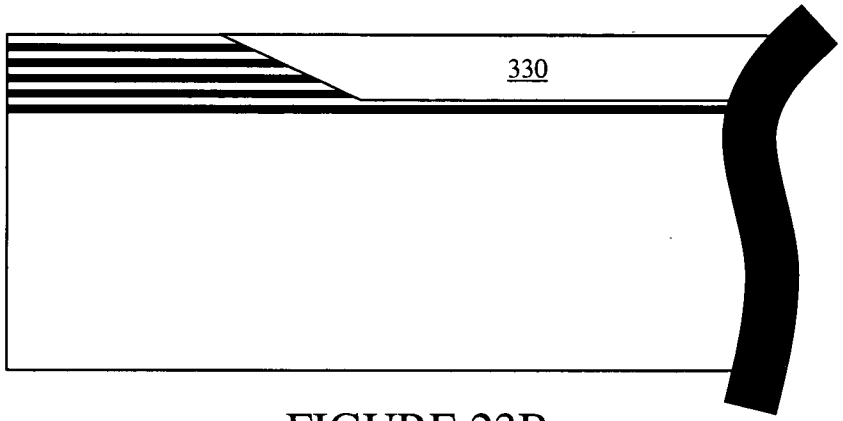


FIGURE 23B

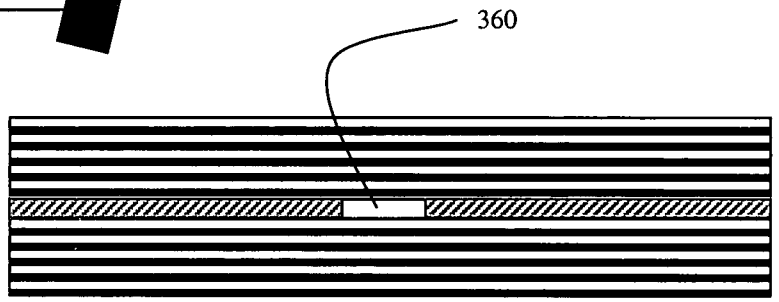


FIGURE 23C

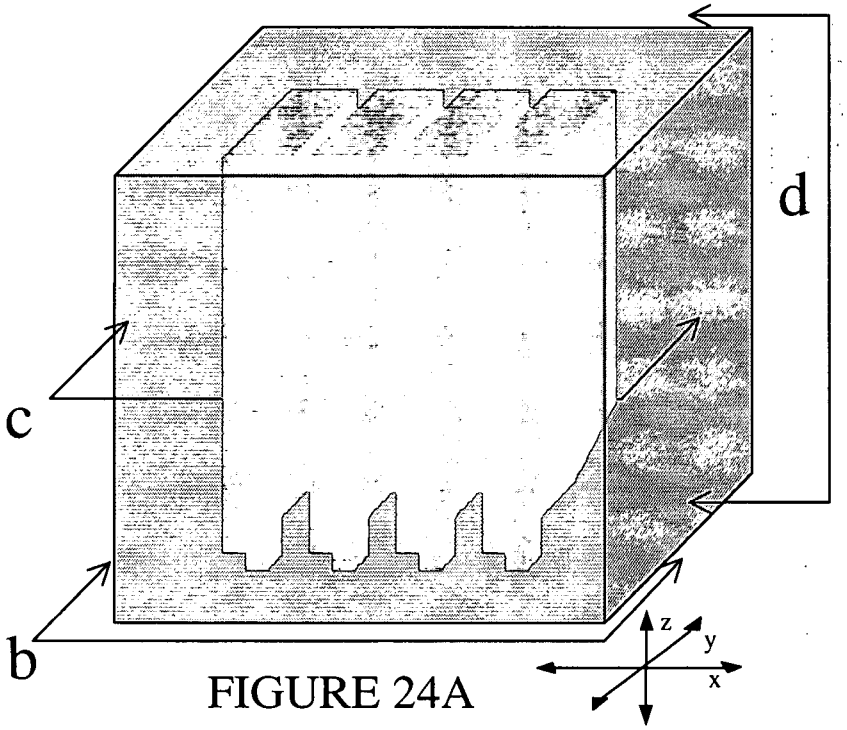


FIGURE 24A

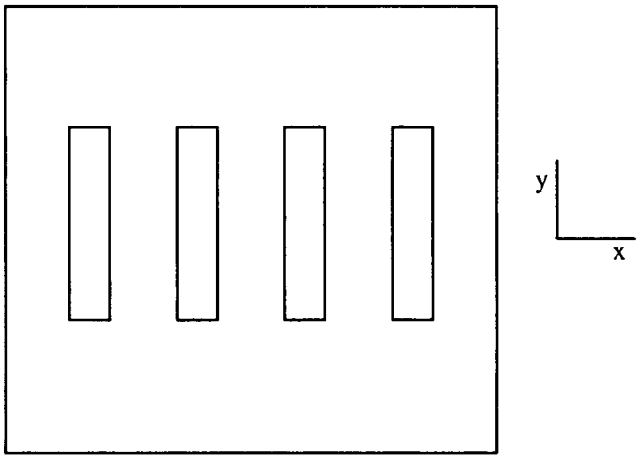


FIGURE 24C

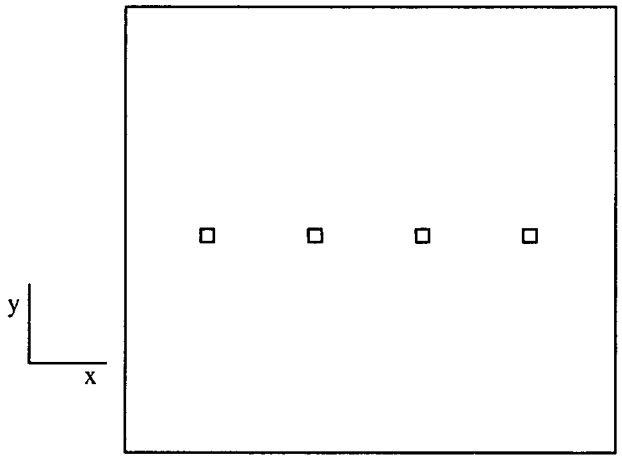


FIGURE 24B

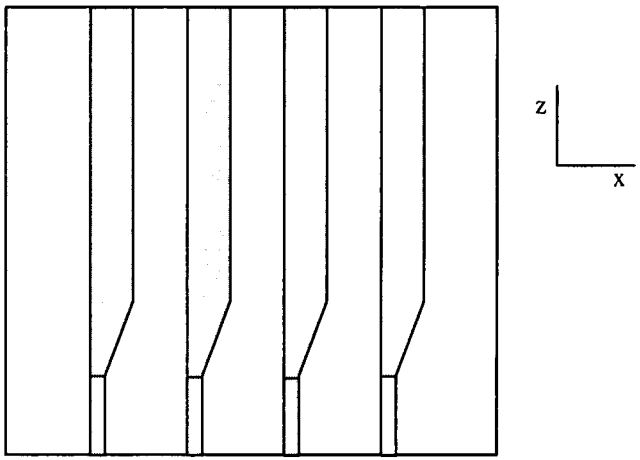


FIGURE 24D

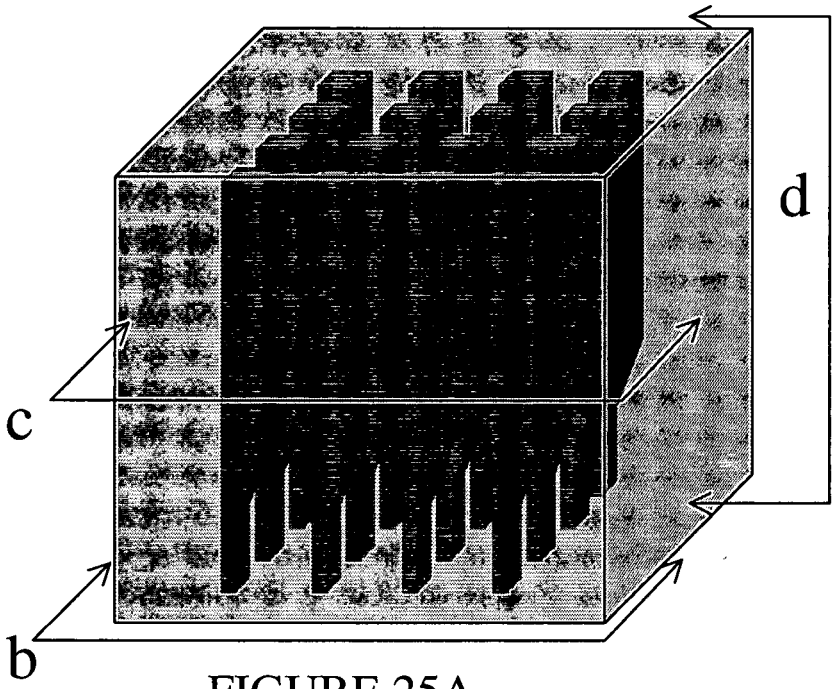


FIGURE 25A

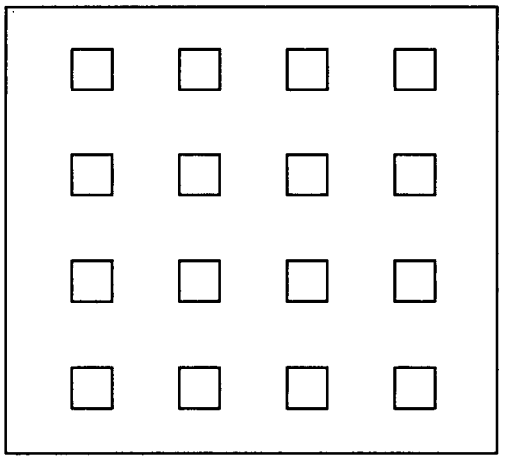


FIGURE 25C

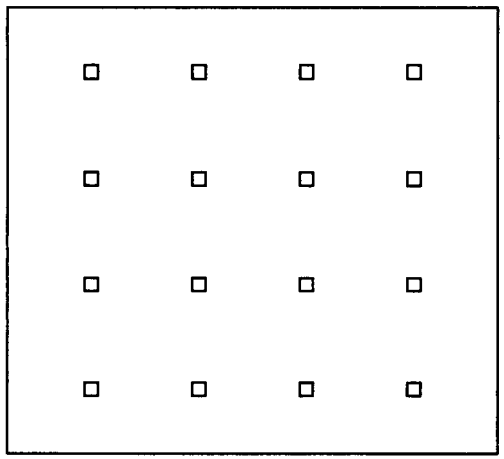


FIGURE 25B

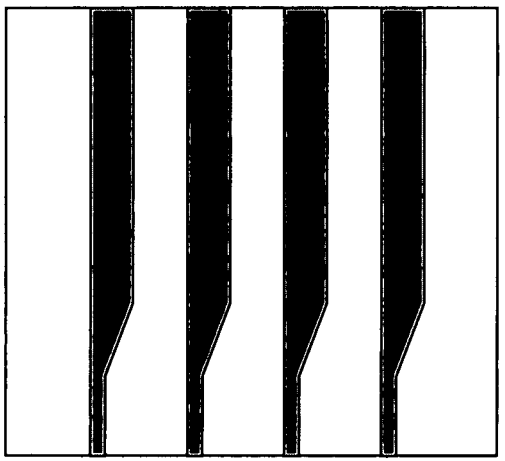


FIGURE 25D

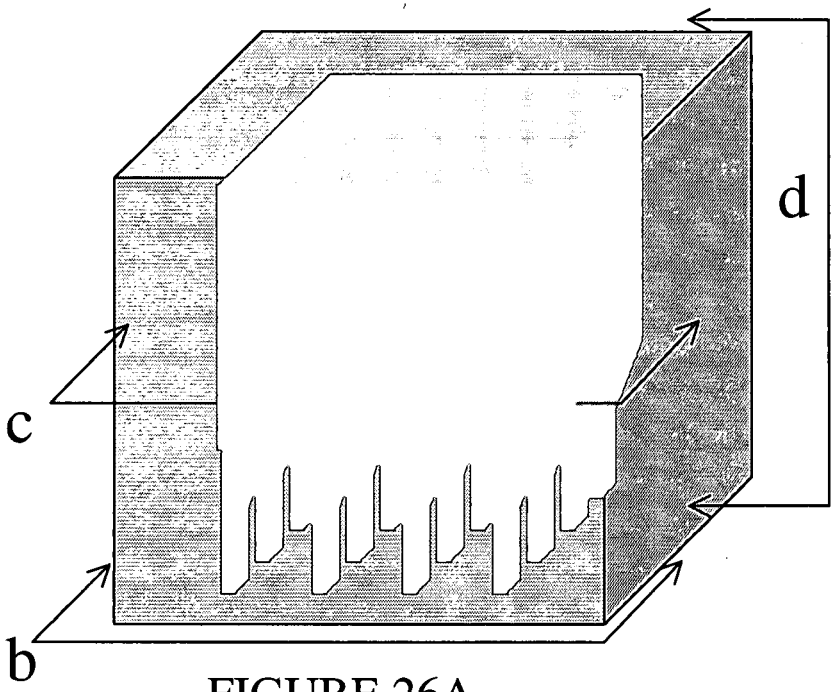


FIGURE 26A

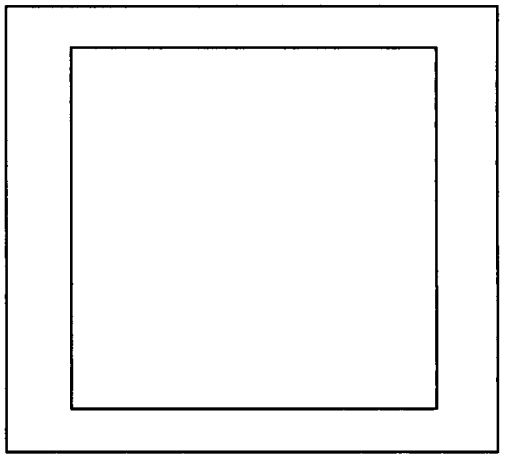


FIGURE 26C

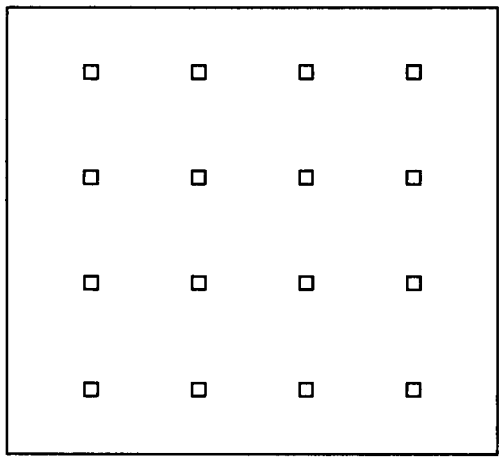


FIGURE 26B

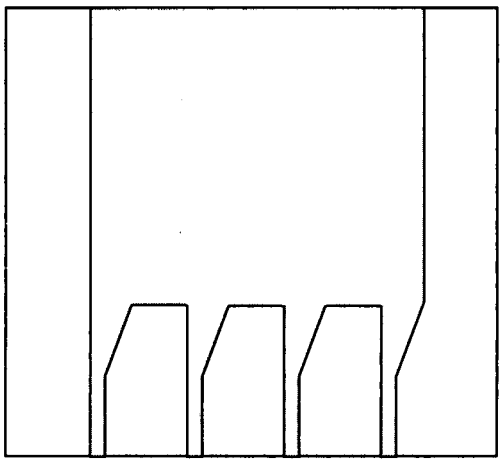


FIGURE 26D

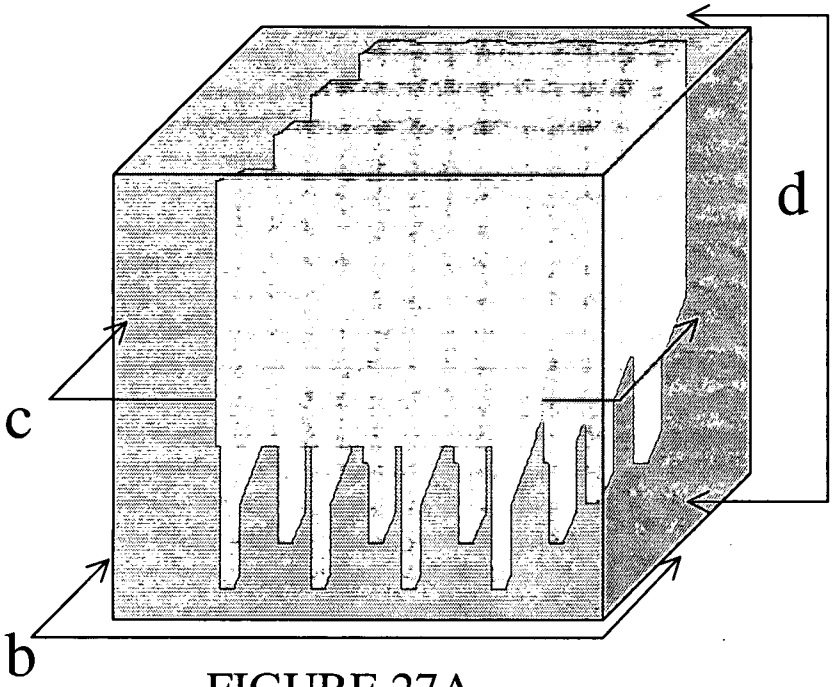


FIGURE 27A

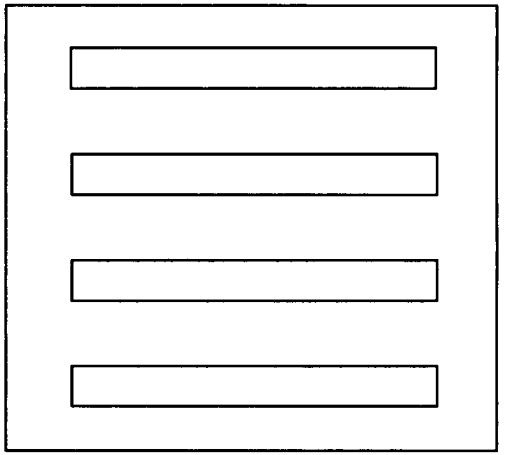


FIGURE 27C

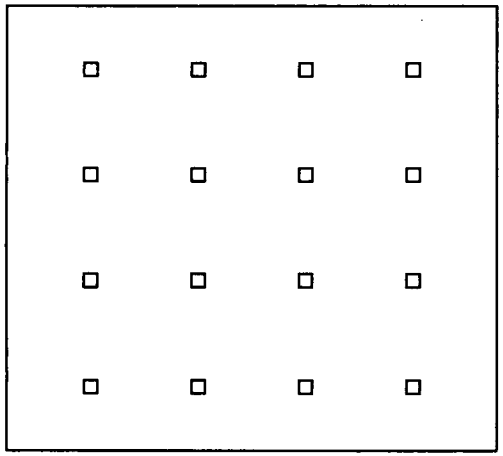


FIGURE 27B

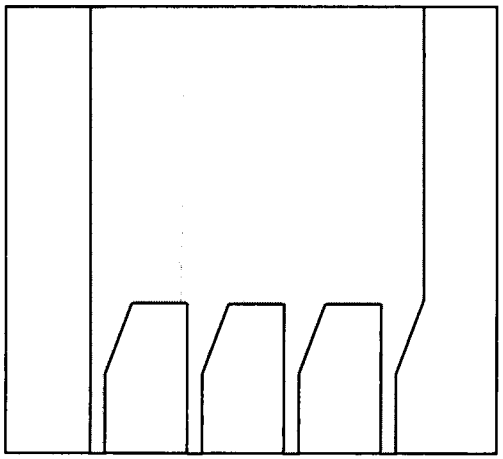


FIGURE 27D

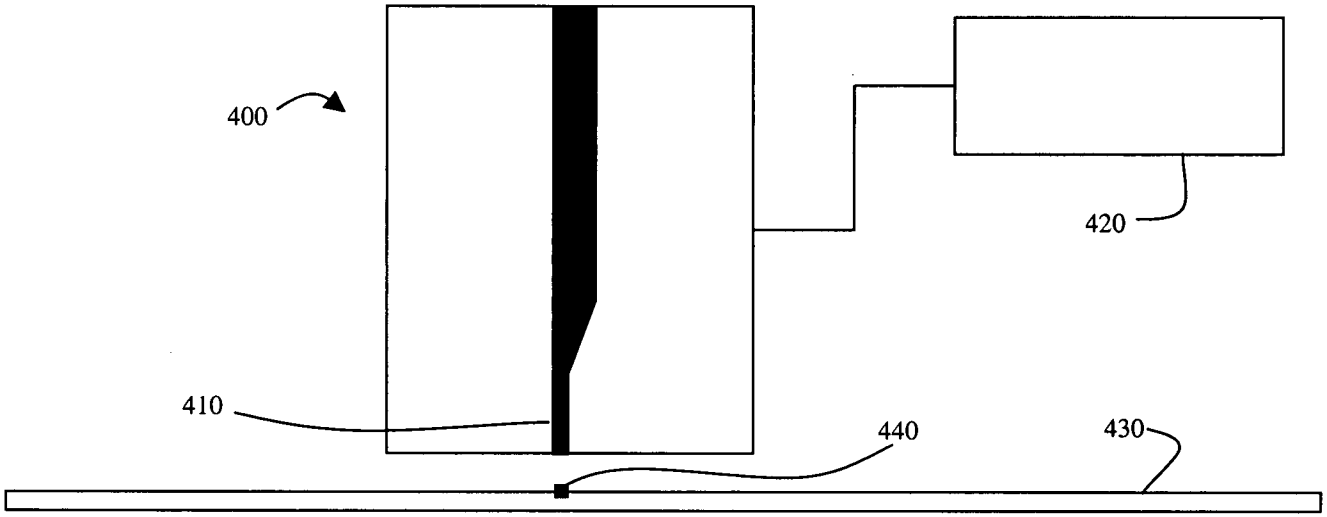


FIGURE 28A

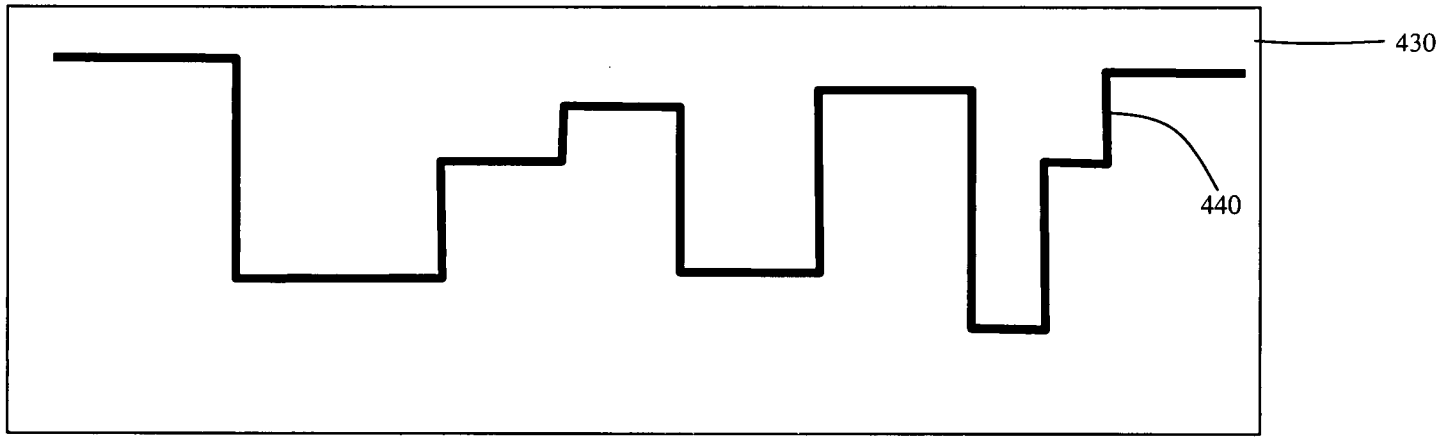


FIGURE 28B

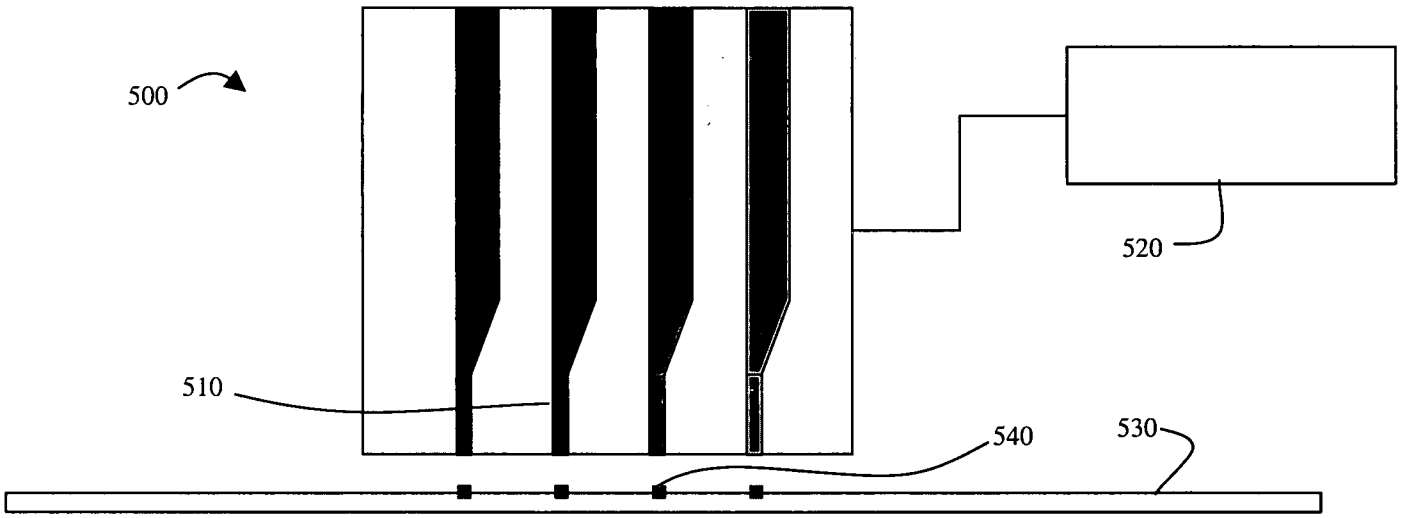


FIGURE 29A

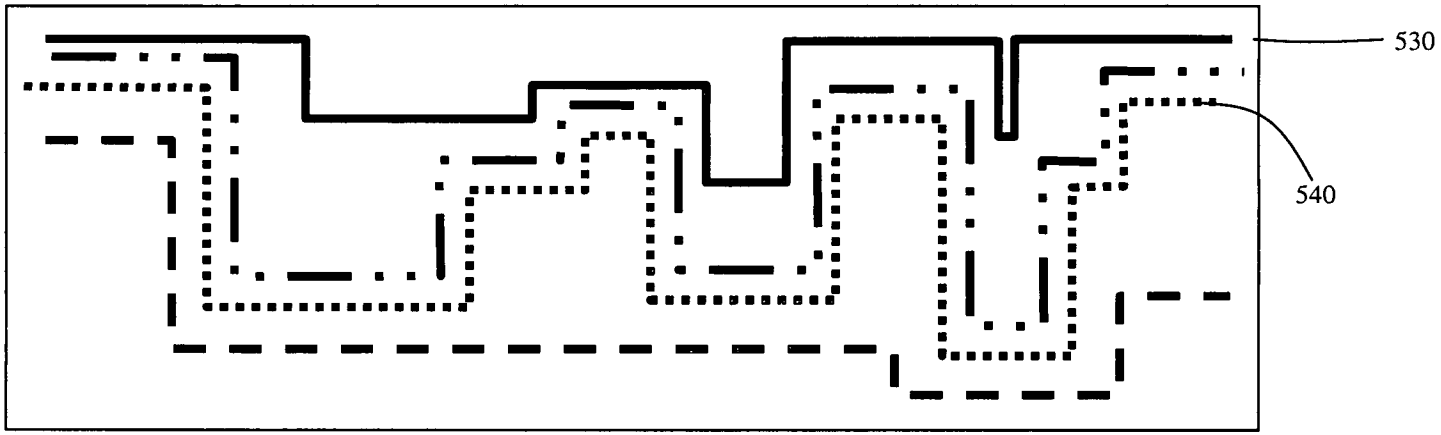


FIGURE 29B

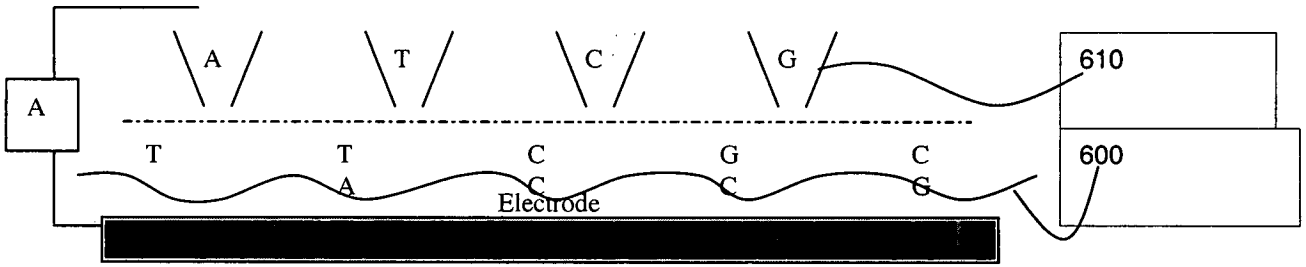


FIGURE 30

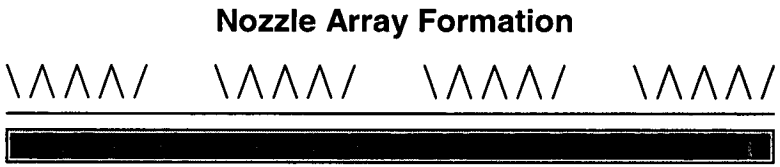


FIGURE 31

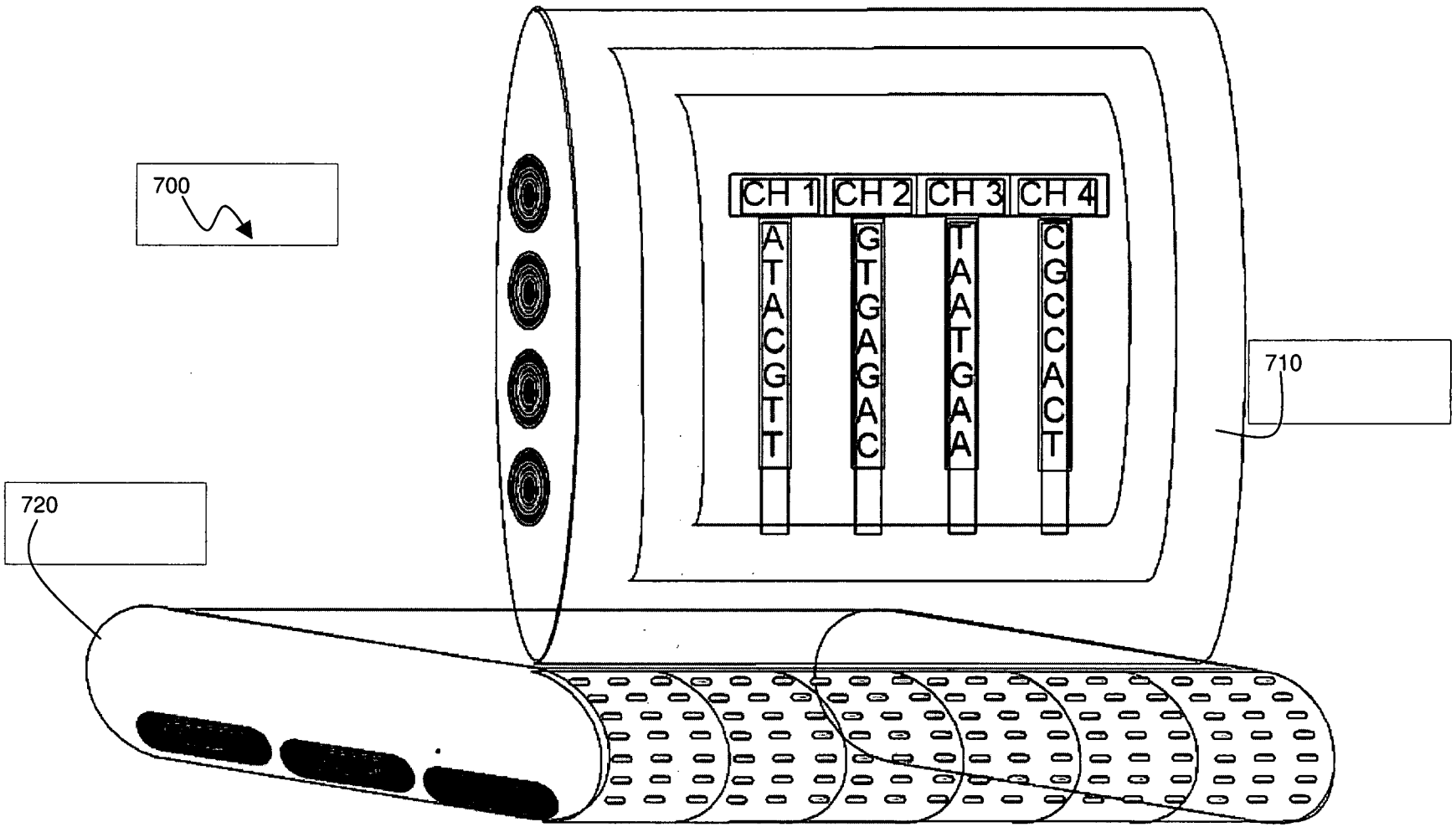
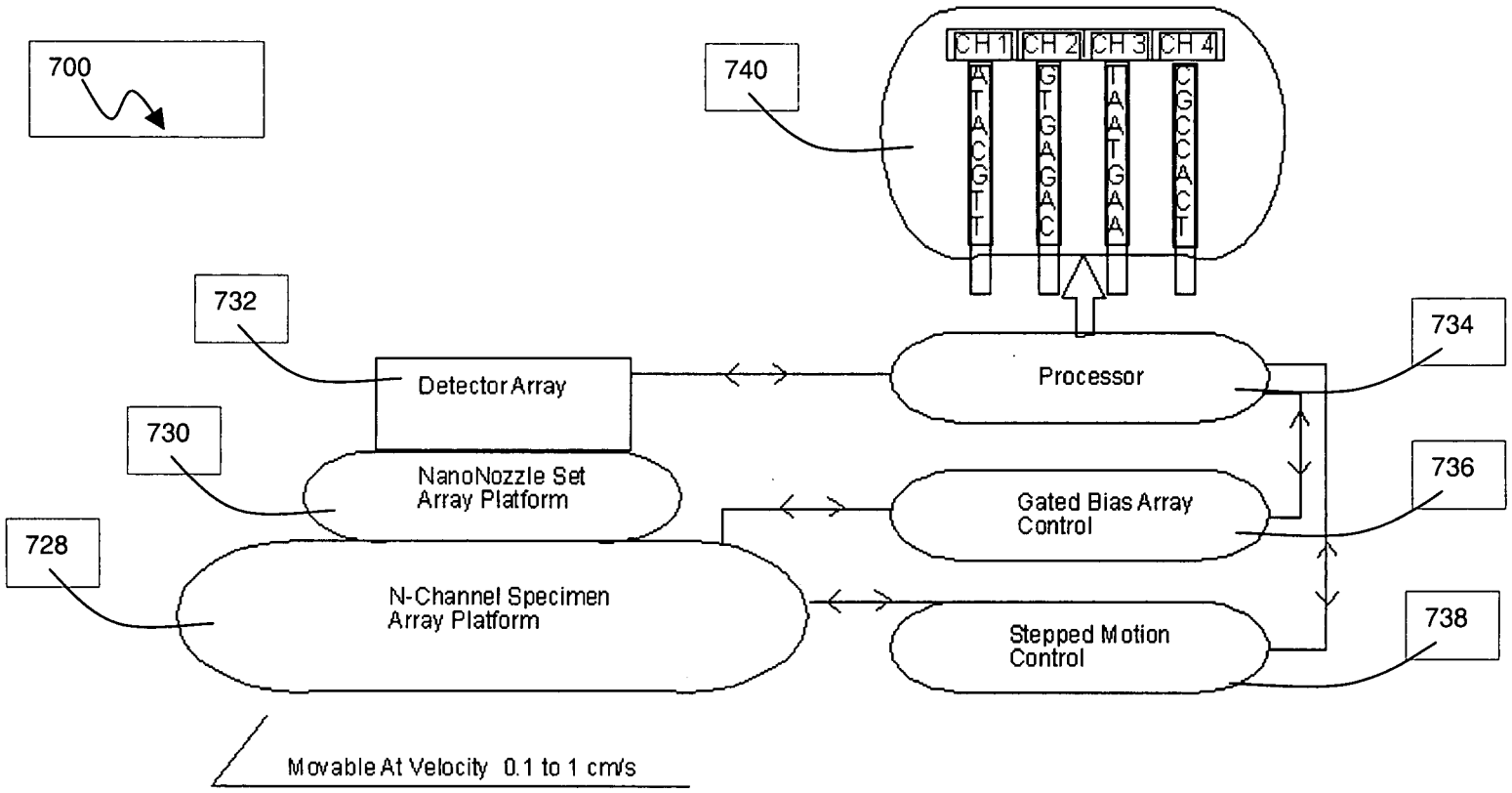


FIGURE 32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740
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CH 2
CH 3
CH 4
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GTGAGAC
TAATGAA
CGCCACT
732
Detector Array
734
Processor
730
NanoNozzle Set
Array Platform
736
Gated Bias Array
Control
728
N-Channel Specimen
Array Platform
738
Stepped Motion
Control
Movable At Velocity 0.1 to 1 cm/s

FIGURE 33

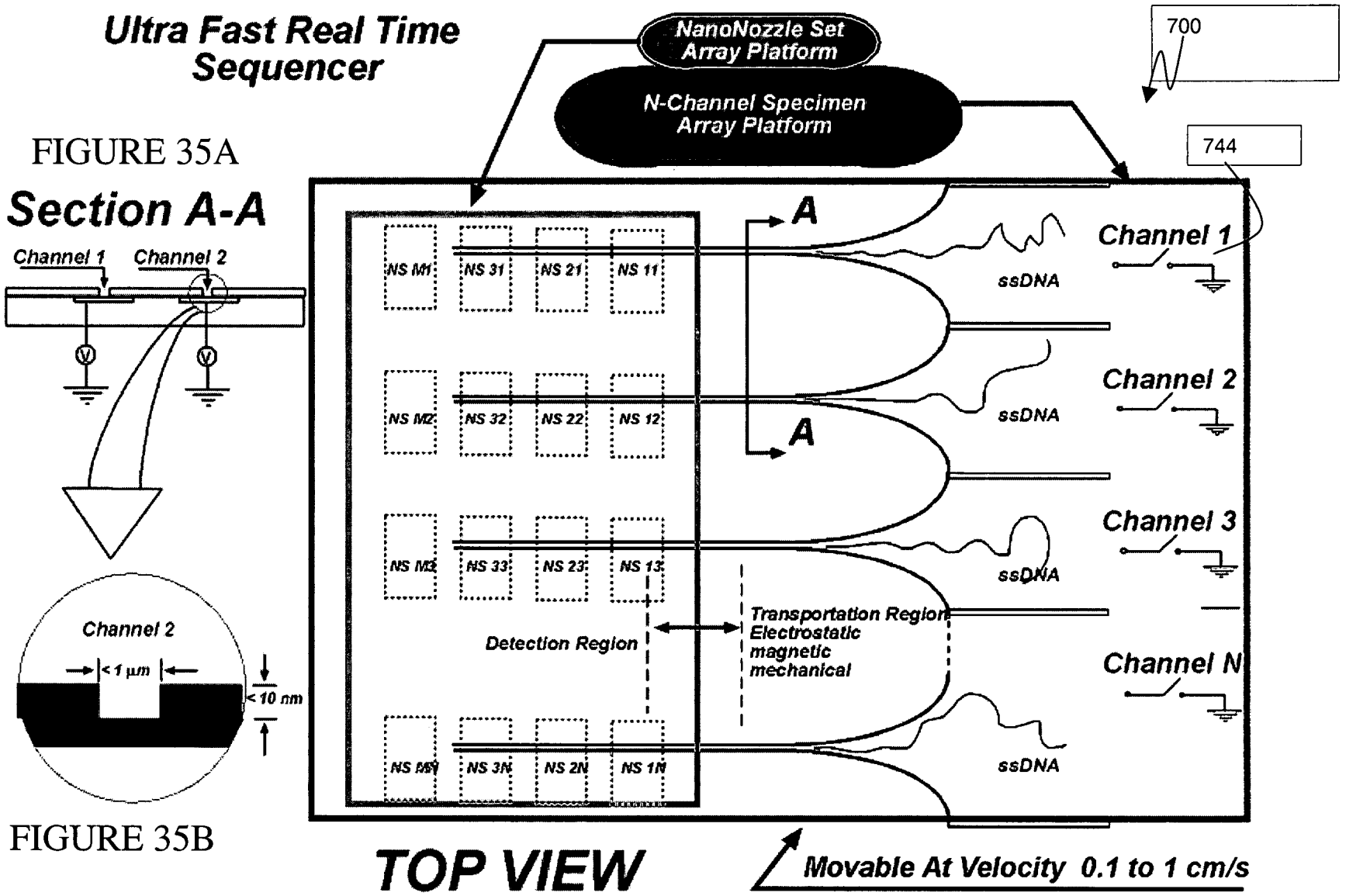

FIGURE 35A

FIGURE 35B

FIGURE 34

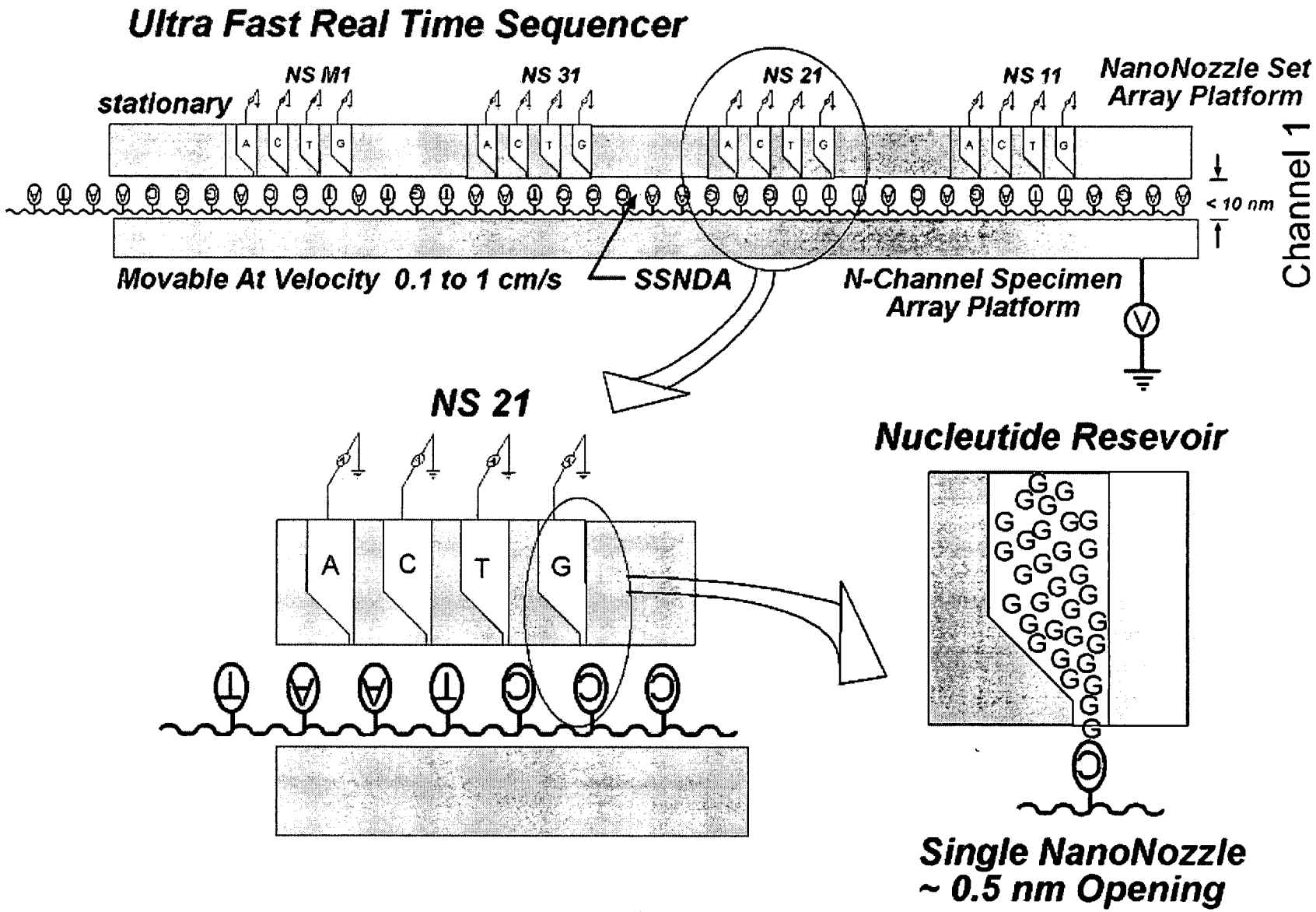
Ultra Fast Real Time Sequencer
NS M1
NS 31
NS 21
NS 11
NanoNozzle Set
Array Platform
stationary
A C T G
< 10 nm
Channel 1
Movable At Velocity 0.1 to 1 cm/s
SSNDA
N-Channel Specimen
Array Platform
V
NS 21
Nucleutide Resevoir
A
C
T
G
Single NanoNozzle
~ 0.5 nm Opening

FIGURE 36

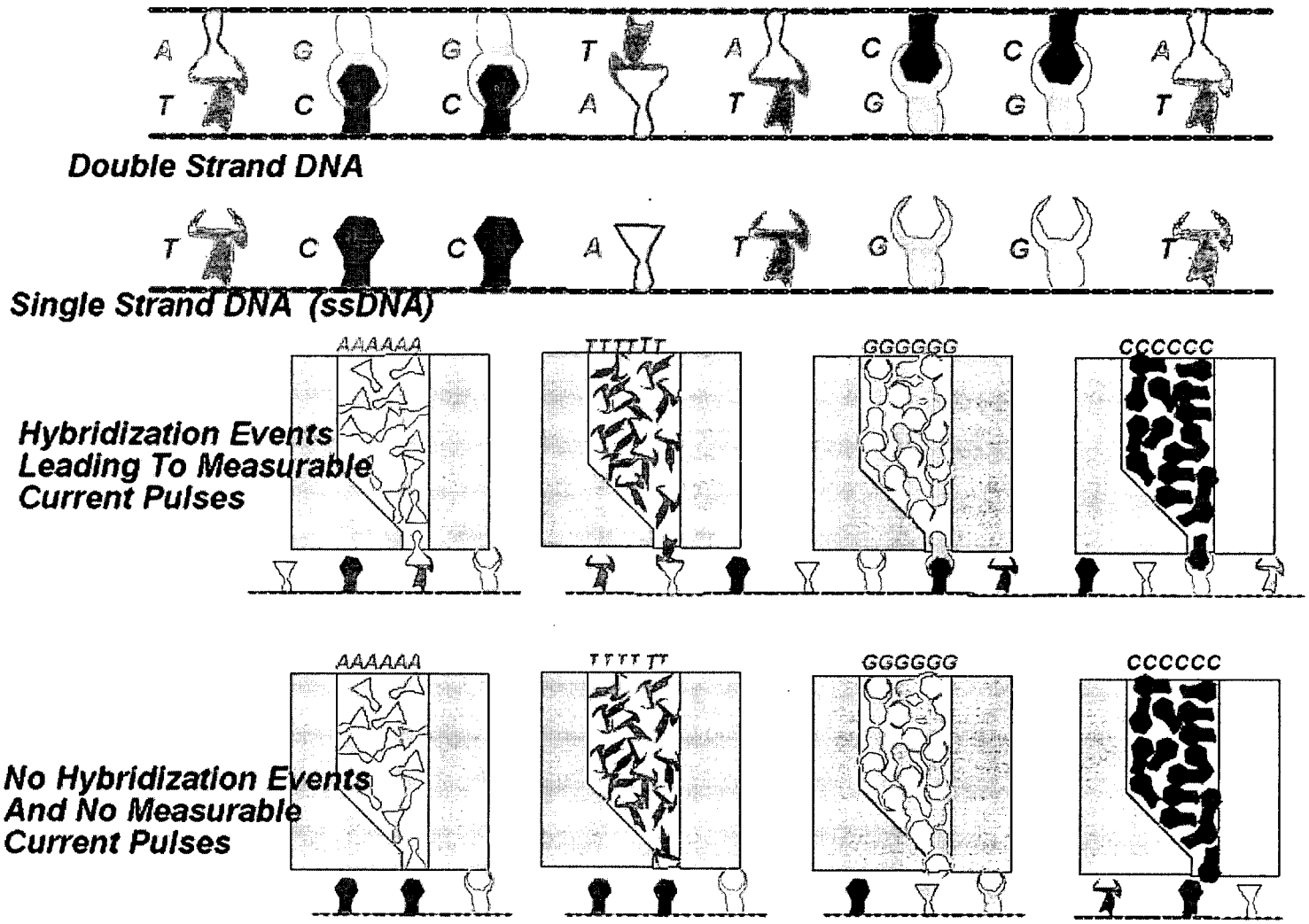
A
G
G
T
A
C
C
A
T
C
C
A
T
G
G
T
Double Strand DNA
T
C
C
A
T
G
G
T
Single Strand DNA (ssDNA)
AAAAAA
TTTTTT
GGGGGG
CCCCCC
Hybridization Events
Leading To Measurable
Current Pulses
AAAAAA
TTTTTT
GGGGGG
CCCCCC
No Hybridization Events
And No Measurable
Current Pulses

FIGURE 37

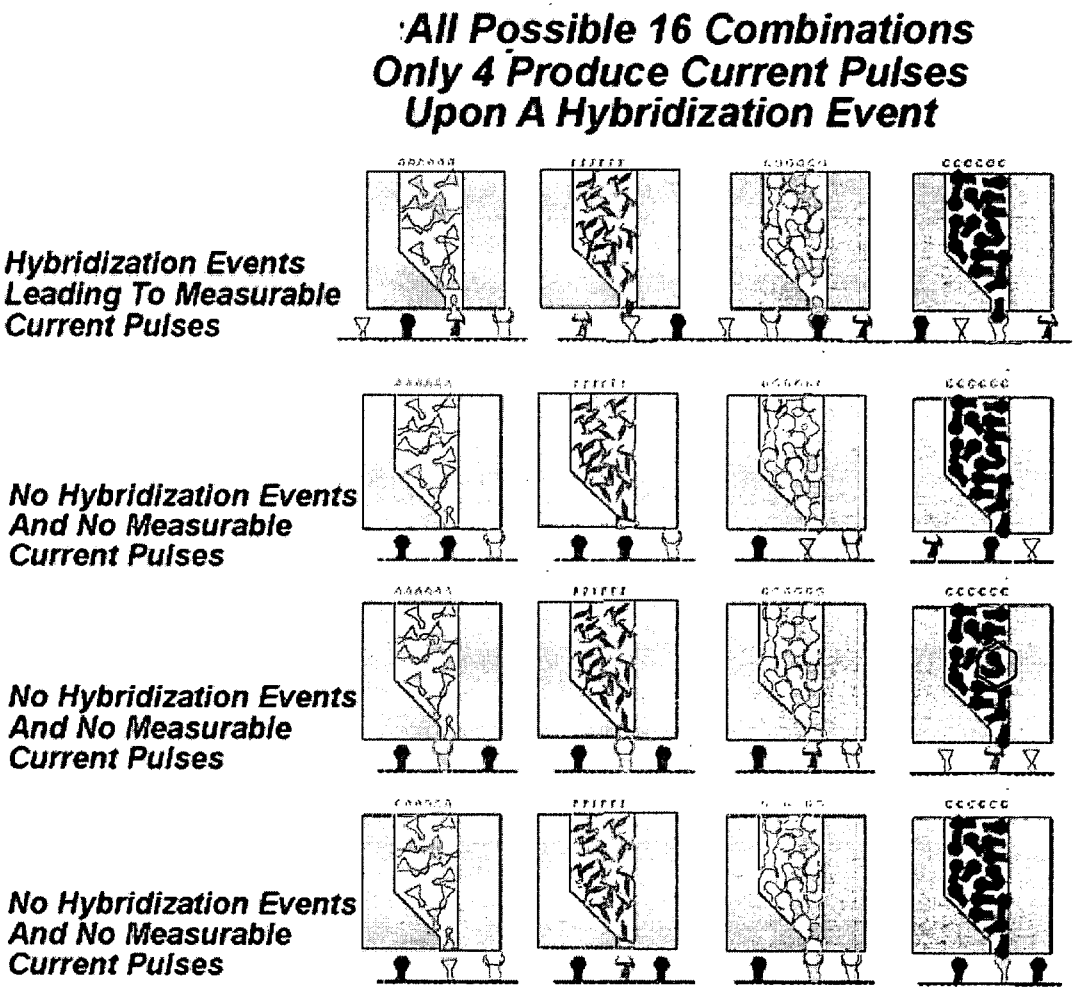
All Possible 16 Combinations
Only 4 Produce Current Pulses
Upon A Hybridization Event
Hybridization Events
Leading To Measurable
Current Pulses
No Hybridization Events
And No Measurable
Current Pulses
No Hybridization Events
And No Measurable
Current Pulses
No Hybridization Events
And No Measurable
Current Pulses

FIGURE 38

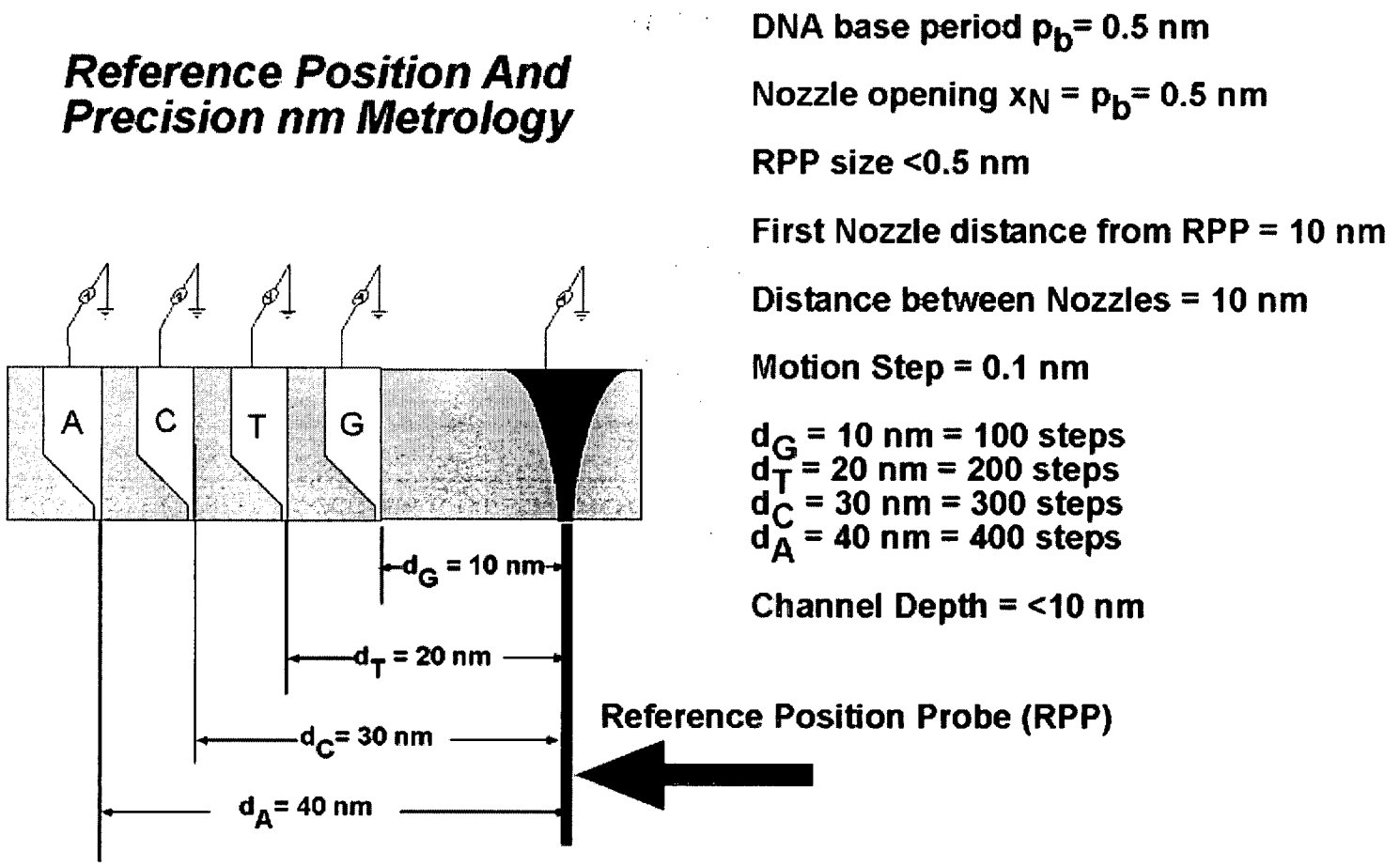
Reference Position And Precision nm Metrology
DNA base period p_b= 0.5 nm
Nozzle opening x_N = p_b= 0.5 nm
RPP size <0.5 nm
First Nozzle distance from RPP = 10 nm
Distance between Nozzles = 10 nm
Motion Step = 0.1 nm
d_G = 10 nm = 100 steps
d_T = 20 nm = 200 steps
d_C = 30 nm = 300 steps
d_A = 40 nm = 400 steps
Channel Depth = <10 nm
A
C
T
G
d_G = 10 nm
d_T = 20 nm
d_C= 30 nm
d_A= 40 nm
Reference Position Probe (RPP)

FIGURE 39

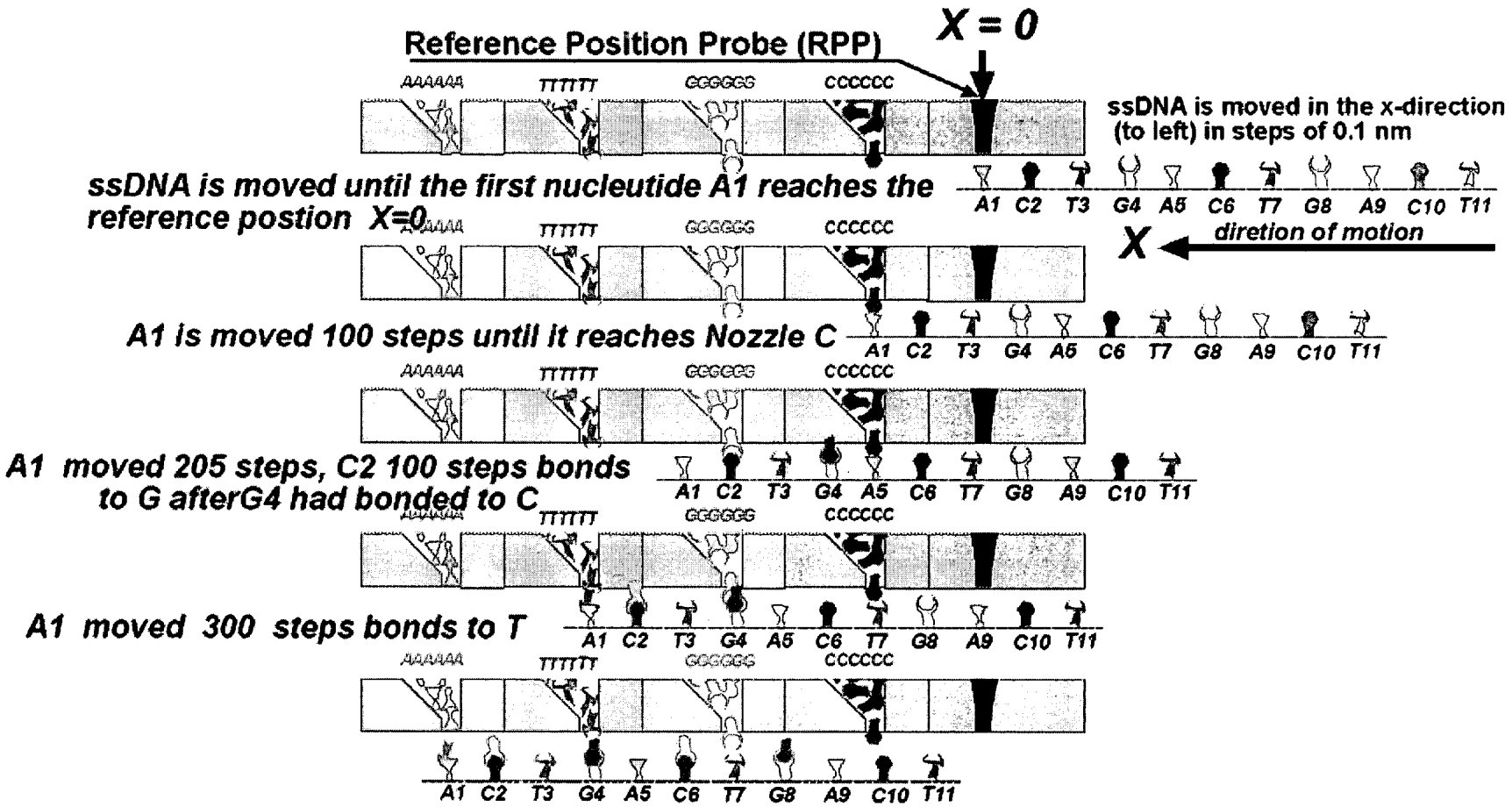
X = 0
Reference Position Probe (RPP)
AAAAAA
TTTTTT
GGGGGG
CCCCCC
ssDNA is moved in the x-direction (to left) in steps of 0.1 nm
A1 C2 T3 G4 A5 C6 T7 G8 A9 C10 T11
ssDNA is moved until the first nucleutide A1 reaches the reference postion X=0
X
diretion of motion
A1 is moved 100 steps until it reaches Nozzle C
A1 moved 205 steps, C2 100 steps bonds to G afterG4 had bonded to C
A1 moved 300 steps bonds to T
A1 moved 400 steps to Nozzle A. Note C6 and G8 had bonded

FIGURE 40